

TABLE OF CONTENTS

CHAPTER 4: Regional Overview of Flood Risk & Salmon Distribution

4.1	Oregon Floodplains	4-2
4.2	Regulatory Floodplains	4-2
4.3	Geomorphic Floodplains	4-2
4.4	Flood Damages	4-3
4.5	1996 Floods	4-3
4.6	Salmon Distribution	4-5
4.7	Ecoregions	4-10

LIST OF FIGURES

Figure 4-1	Oregon Regulatory Floodplains	4-3
Figure 4-2	Oregon Geomorphic Floodplains	4-4
Figure 4-3	NFIP Claims between 1977 and 1998	4-4
Figure 4-4	NFIP Claims February 1996 to February 1997	4-5
Figure 4-5	Damage by County Source: Interagency Hazard Mitigation Team Report, 1996	4-6
Figure 4-6	Damage as Percent of Annual Budget	4-7
Figure 4-7	Coho Salmon Distribution	4-7
Figure 4-8	Spring Chinook Distribution	4-8
Figure 4-9	Chum Salmon Distribution	4-8
Figure 4-10	Fall Chinook Distribution	4-9
Figure 4-11	Winter Steelhead Distribution	4-9
Figure 4-12	Combined Distribution of all Five Species	4-10
Figure 4-13	Ecoregions of Oregon	4-11
Figure 4-14	Oregon Coast Ecoregion with NFIP Claims and Salmon Distribution	4-12

4. Regional Overview of Flood Risk and Salmon Distribution

As with other states in the U. S., Oregon has seen flood damages steadily increase while the natural benefits of functioning floodplains have decreased. The recent listing of a number of anadromous fish species in Oregon is a significant indicator of floodplain degradation. Oregon has an opportunity to manage its floodplains in a way that reduces flood damages while preserving and even restoring the habitats needed to support anadromous fish populations. However, not all of the state's floodplains have equal potential. Some floodplains are not significant to anadromous fish while others don't have costly damage problems. In the western part of the state, high rainfall and significant human population centers combined with a dense network of streams that drain to the ocean increase the coincidence of fish habitat and flood damages. The Tillamook basin is home to a significant number of anadromous fish species and has had the highest flood damages in the state. This makes the Tillamook basin a potential testing ground for an Integrated River Management Strategy (IRMS) that combines goals for flood damage reduction with aquatic habitat preservation and restoration. This section characterizes the significance of Oregon floodplains for flood risk and fish habitat and demonstrates a rationale for locating areas within the state where an IRMS would be effective.

4.1 Oregon Floodplains

Oregon's terrain varies dramatically and so do its floodplains. This diversity enhances the state's capacity to support a wide variety of terrestrial and aquatic species. Flooding is an ephemeral process with much uncertainty associated with the magnitude, frequency and spatial extent of the resultant floodplain on the landscape. Because of this uncertainty, several methods have been used to define and characterize the flood process. In order to broadly characterize floodplains at the state level for this study, geomorphic floodplains (floodplains defined by soils that have floodprone characteristics) were used. The geomorphic floodplain data layer was combined with other state-wide GIS data to perform a strategic spatial analysis of the floodplain characteristics in Oregon.

4.2 Regulatory Floodplains

Probably the most familiar floodplain definition to many people is the regulatory 100-year floodplain delineated by the Federal Emergency Management Agency (FEMA) for use in the National Flood Insurance Program (NFIP). The NFIP was created to encourage the adoption of floodplain development guidelines within FEMA-designated flood hazard zones by providing flood insurance to communities that adopted those guidelines. The FEMA 100-year floodplain represents a theoretical flood hazard area that is estimated to result from the occurrence of the "100-year flood", a flood that has a 1-percent chance of happening in any given year. The 100-year flood has a statistical value derived from historic streamflow data and the hydrologic characteristics of a particular watershed.

Since the regulatory 100-year floodplain data were developed as a part of the NFIP, the mapping of the regulatory 100-year floodplain is limited to urban or developing areas. Consequently, large portions of south, southeast and southwest Oregon are not covered

by FEMA floodplain data. Lack of coverage makes it impossible to do state-scale analysis using FEMA-defined floodplains (Figure 4-1).

4.3 Geomorphic Floodplains

Geomorphic floodplains are defined by soils subject to flooding. This information is derived from the State Soil Geographic Data Base (STATSGO) (Figure 4-2). STATSGO soils data are derived from 1:250,000 generalized soils maps and are available only in digital format. These data are compiled by generalizing more detailed soil survey maps which are based on field observations. STATSGO should be used for state or regional resource planning and should not be used for interpretation at the county level (U. S. Department of Agriculture, 1991).

The STATSGO data include 217 map units. Each map unit represents a group of soils that have been developed from similar geologic materials on similar landscapes and in similar climatic regions (Thorson *et al.*, 1996). Geomorphic floodplains are delineated based on map units where ten percent or more of the soils comprising each individual map unit are subject to rare, occasional or frequent flooding. Rare flooding is defined as flooding that is unlikely but possible under unusual weather conditions, with a 1 to 5 percent chance of flooding in any year. These statistics are similar to the familiar FEMA regulatory floodplains that also delineate land areas that have a 1-percent probability of flooding in any year. Therefore, the geomorphic floodplains have been used in the remainder of this discussion because they represent a natural expression of a 100-year flood event and they are mapped for the entire state.

4.4 Flood Damages

A simple way to link geomorphic floodplains to flood events is to map them with NFIP claims. These claims do not provide a complete picture of flood damage in the State as NFIP claims only represent damages to structures in urban areas. There are different programs that cover damages to equipment, crops, and livestock associated with agriculture.

The NFIP claims mapped for the State of Oregon in Figure 4-3 are all claims filed between 1977 and 1998 for which a location was available. Most of the people in Oregon live west of the Cascade Mountains in the Willamette Valley and most of the rainfall in the State falls in the Coast Range. Not surprisingly, a majority of the NFIP claims are located in these areas.

4.5 1996 Floods

Some of the most damaging floods in Oregon occurred in February of 1996. The combination of rain and warm temperatures from a series of intense surges of tropical

moisture, preceded by freezing temperatures and a deep snowpack created the extreme flood situation. These ‘rain on snow’ events are associated with many of Oregon’s most damaging floods.

By January 31, 1996, the average snowpack in the Oregon Cascades was about 115-percent of normal and in Washington about 130-percent of normal.

Low-elevation snow was reported at 500- to 600-percent of normal, and there was snow on the Willamette Valley floor. There was an intense cold spell the week of January 29th and on February 3rd a moderate storm dropped rain on frozen ground.

Most basins of Northwest Oregon and Southwest Washington had received precipitation for the water year at least 125-percent of normal (some as high as 200-percent) which saturated the soils and brought up groundwater levels. Four-day totals of precipitation exceeded previous records at many locations in the states of Oregon and Washington, Astoria (8.9 in), Corvallis (8.1 in), and Oregon City (7.5 in). The spatial

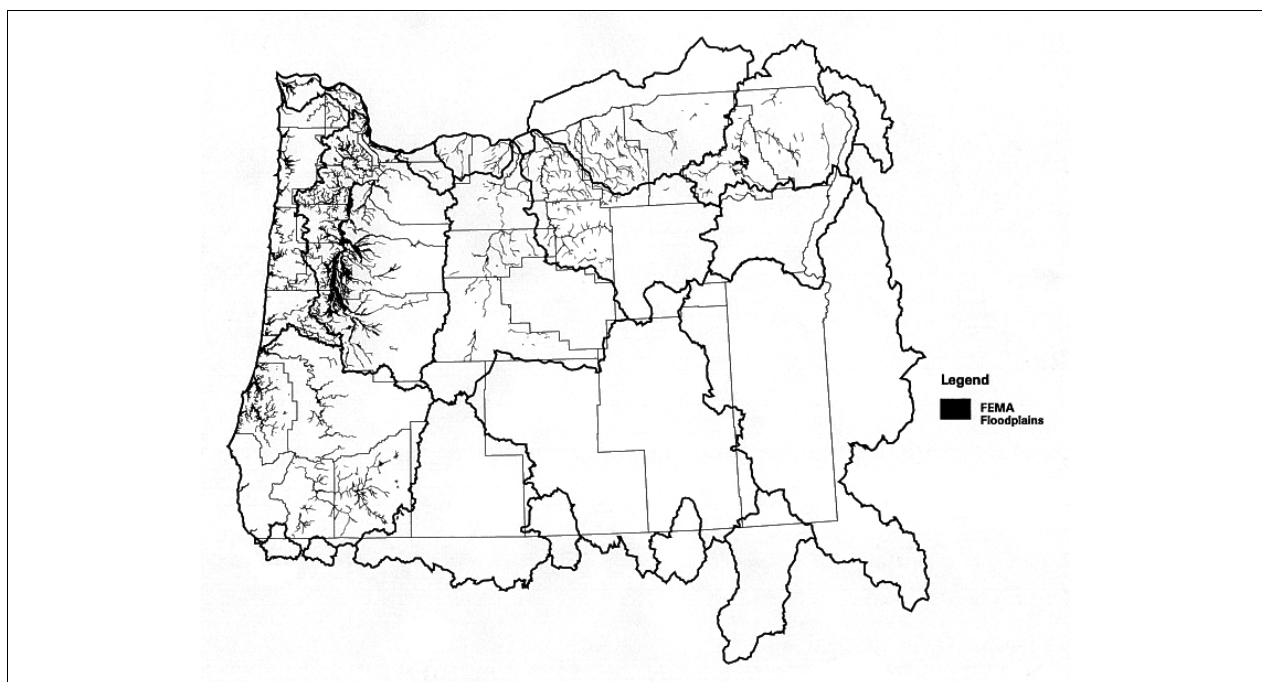


Figure 4-1. Oregon Regulatory Floodplains

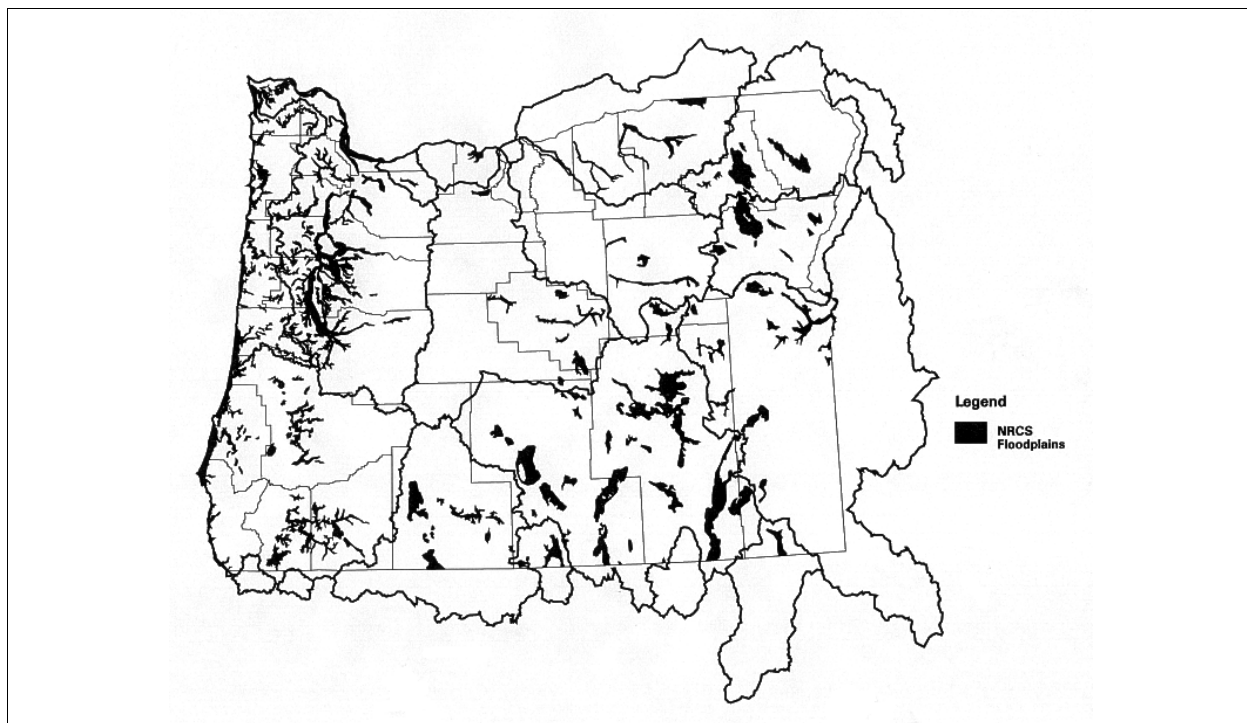


Figure 4-2. Oregon Geomorphic Floodplains

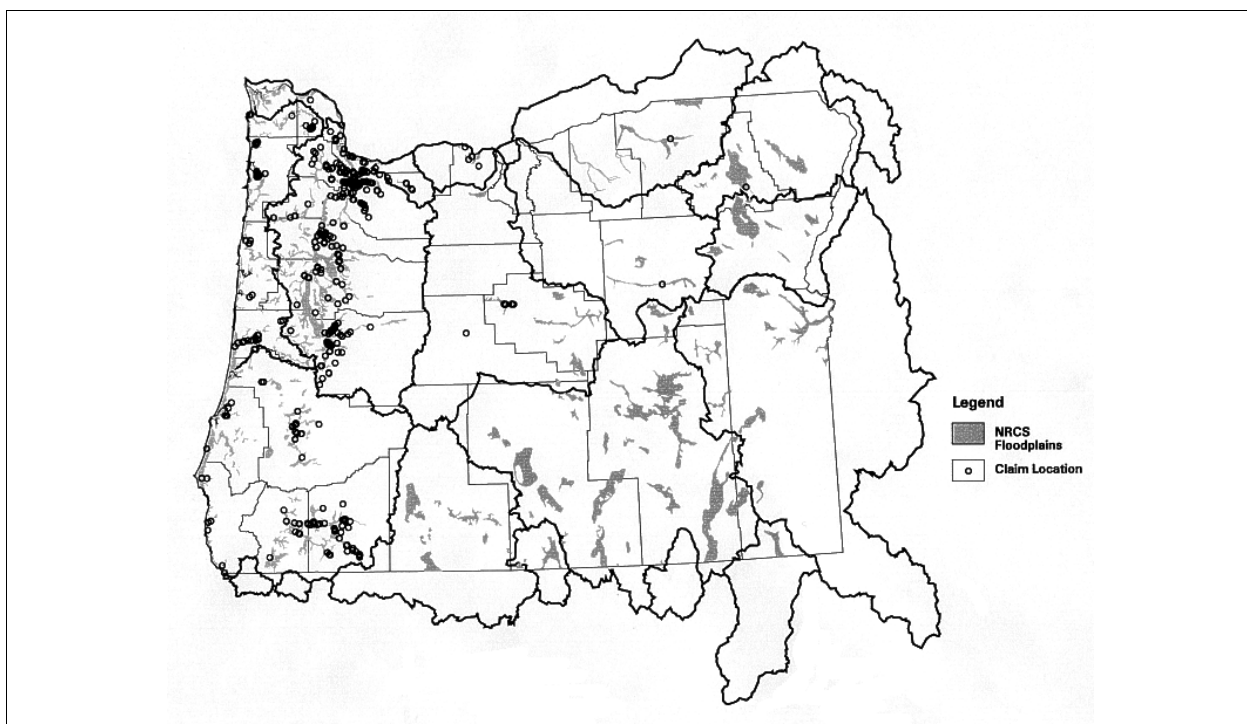


Figure 4-3. NFIP Claims between 1977 and 1998

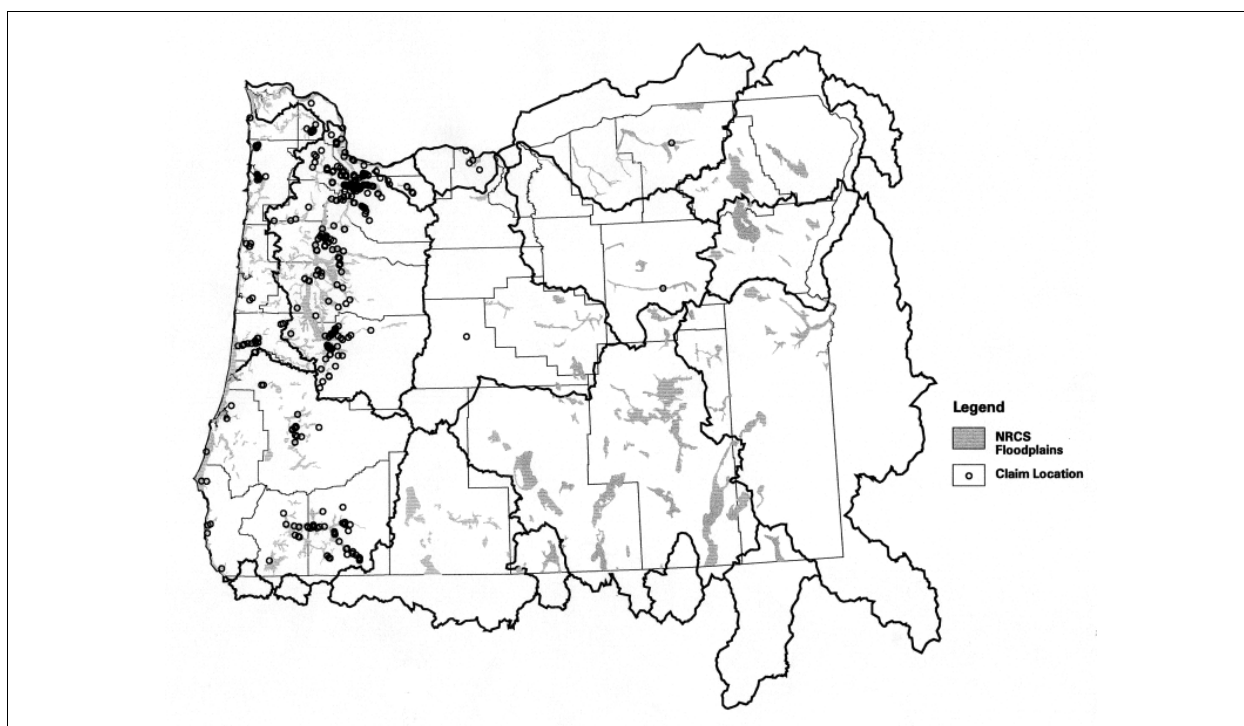


Figure 4-4. NFIP Claims February 1996 to February 1997

distribution of claims the year following the February 1996 floods is illustrated in Figure 4-4.

Of all Oregon counties affected by the 1996 floods, Tillamook County sustained the highest amount of damage (Figure 4-5). The county also had the highest amount of damage as a percentage of the annual budget (Figure 4-6). Total February 1996 flood damages were estimated at \$53 million. Numerous flood response permits were applied for in Tillamook County and statewide.

The distribution of flood damage claims is a reasonable proxy for the distribution of flood control activity. As discussed earlier, these projects take a number of forms including dams, levees, dikes, and channelization each of which has negative effects on aquatic habitat.

4.6 Salmon Distribution

In light of this connection between flood control projects and the degradation of aquatic habitat, it is useful to characterize the relationship of Oregon's floodplains to anadromous fish populations. By definition, anadromous fish spend part of their lives in the ocean, but not all of Oregon's floodplains are hydrologically connected to the ocean.

Figures 3-7 thru 3-11 show the geomorphic floodplain data layer mapped with the streams utilized by coho, chum, spring chinook, fall chinook, and winter steelhead. Each of these species occurs and is listed in the Tillamook basin. The shaded drainage basin in south central Oregon represents land area not tributary

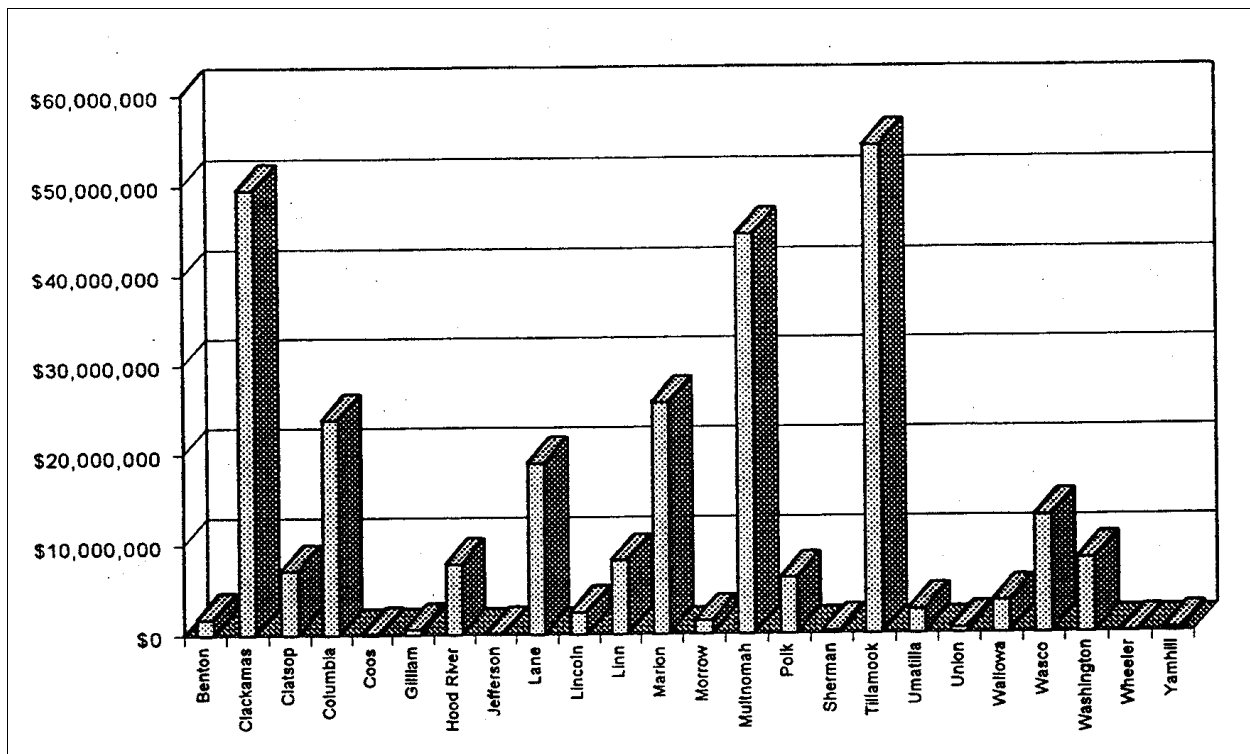


Figure 4-5. Damage by County Source: Interagency Hazard Mitigation Team Report, 1996

to the ocean and, therefore, not part of the distribution of anadromous salmon. The spatial distribution of these species is heavily weighted toward coastal areas and the Willamette basin. High precipitation and dense conifer

vegetation combine with good access to ocean habitats in these areas to make them attractive to anadromous fish. A visual comparison of the State's NFIP floodplains (Figure 4-1) and the combined distribution of the five salmon species (Figure 4-12), shows how ubiquitous salmon are to regulated waterways.

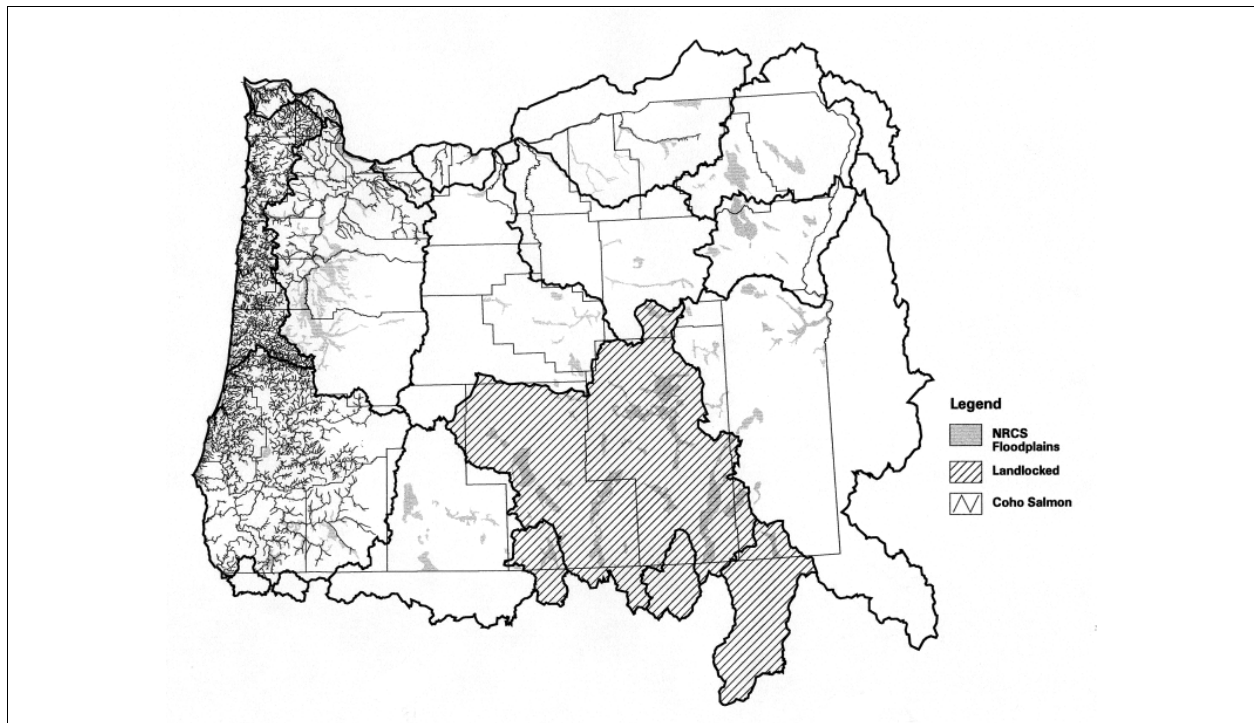


Figure 4-7. Coho Salmon Distribution

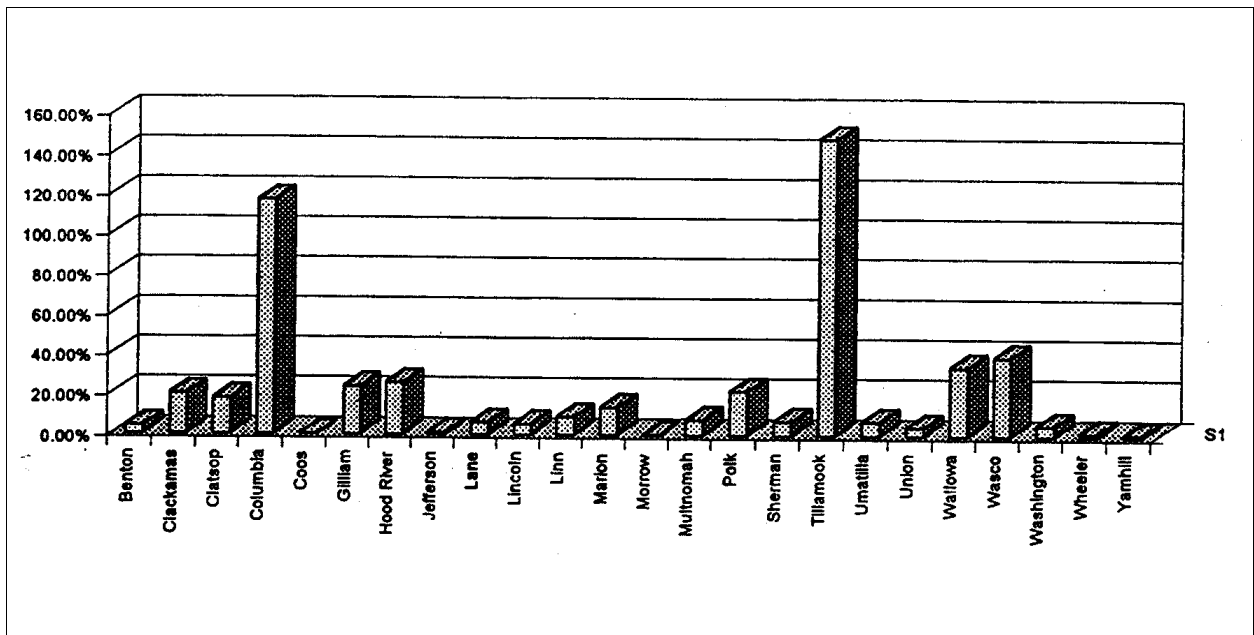


Figure 4-6. Damage as Percent of Annual Budget Source: Interagency Hazard Mitigation Team Report, 1996

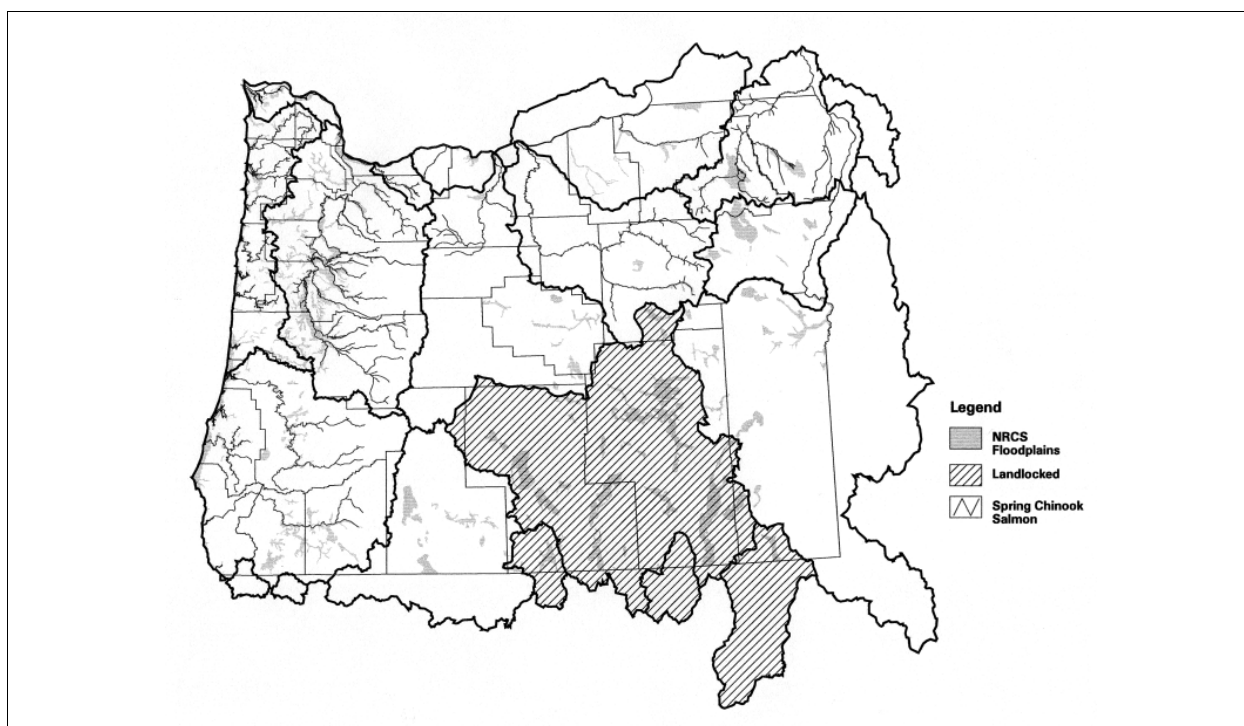


Figure 4-8. Spring Chinook Distribution

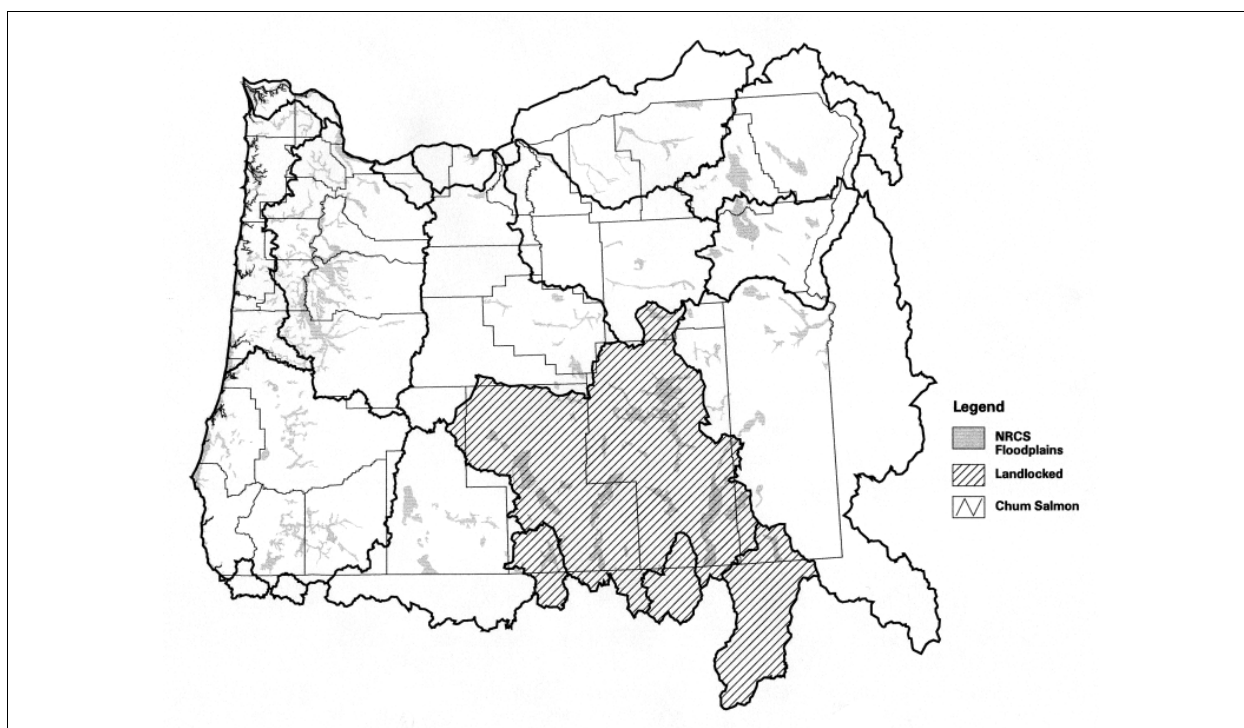


Figure 4-9. Chum Salmon Distribution

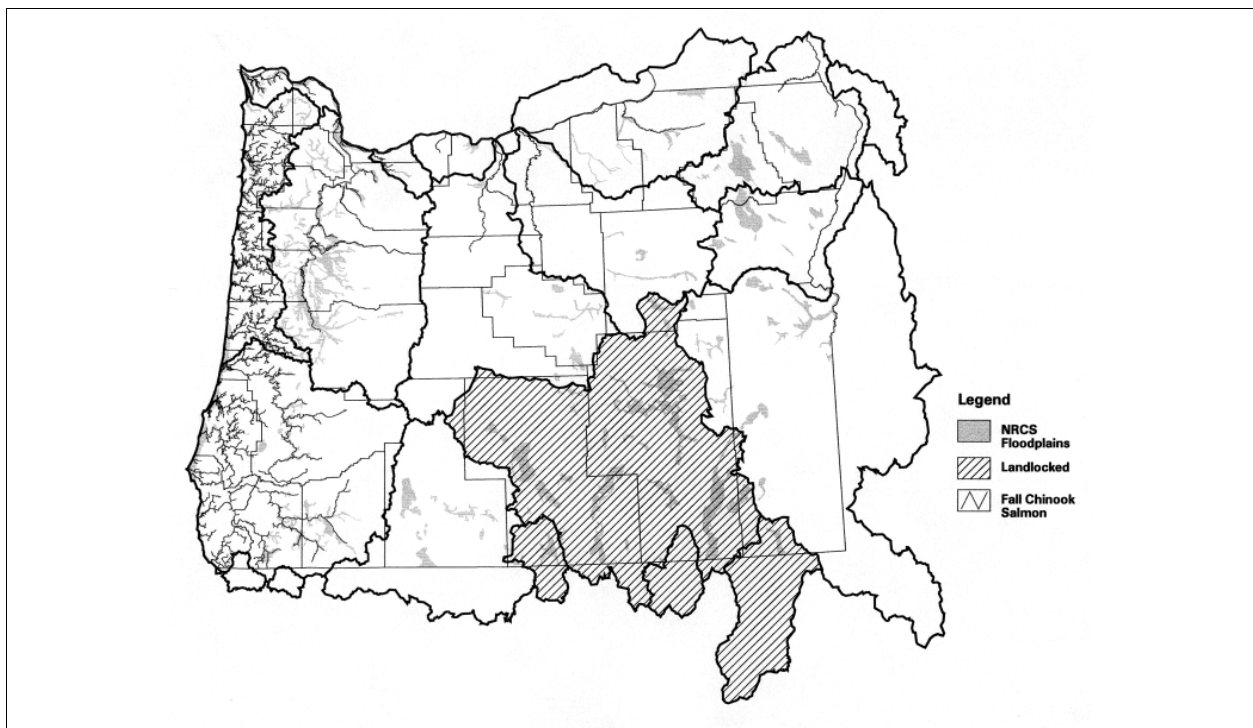


Figure 4-10. Fall Chinook Distribution

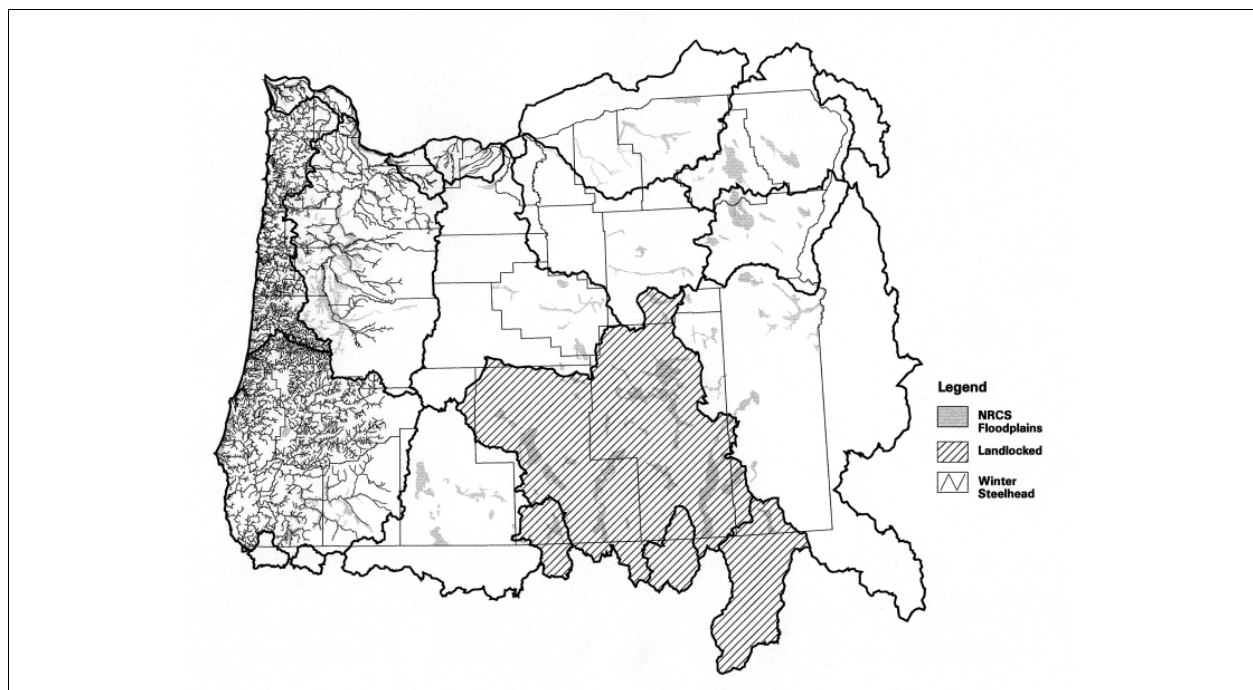


Figure 4-11. Winter Steelhead Distribution

4.7 Ecoregions

The appropriateness of a floodplain management strategy is dictated by environmental conditions. Ecoregions are a scientifically accepted way to divide the landscape based on environmental conditions. Ecoregions, as defined by the USEPA, are distinguished based on precipitation patterns and amounts; physiography, geology, soils, and potential vegetation; land use and land cover. As such, they describe areas with similar ecological communities. Because of this commonality it is not surprising that species of salmon favor certain ecoregions as habitat.

The Coast Range ecoregion (Figure 4-13) includes parts of western Washington, Oregon, and northwestern

California. It can generally be divided into three zones: coastal lowlands, coastal uplands, and a number of montane zones that include volcanic and mid-coastal sedimentary areas. The montane areas occur above 500-feet and are generally steep and covered with conifer forest. They vary from highly erosive soils that are prone to mass movement to relatively stable rock. Coastal uplands are marine influenced humid area between 300 and 500-feet that corresponds to the historic distribution of Sitka spruce forest. This area gradually transitions to the coastal lowland zone which includes marshes, lakes, and dune areas (Pater *et al.*, 1997). The region as a whole receives a tremendous amount of precipitation and has relatively stable temperatures due to marine influence.

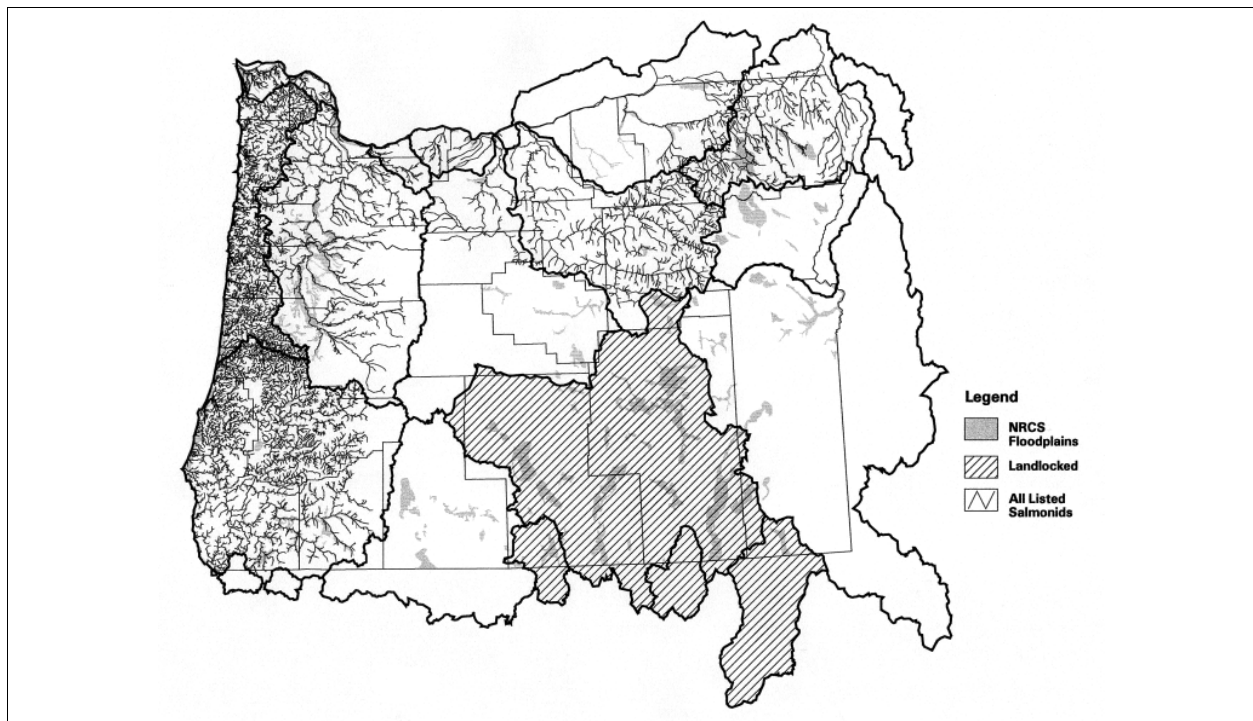


Figure 4-12. Combined Distribution of all Five Species

The environmental qualities of the region make it ideal for timber, dairy, fishing and recreation uses. It is, therefore, understandable that conflicts between these uses and habitats occur within this ecoregion.

A comparison of the distribution of NFIP claims following the 1996 floods and the location of streams

significant to all five species of salmon within the coastal ecoregion graphically shows the significance of Tillamook Bay within this region (Figure 4-14), and the need for complementary management of fisheries resources and flood risk reduction.



Figure 4-13. Ecoregions of Oregon

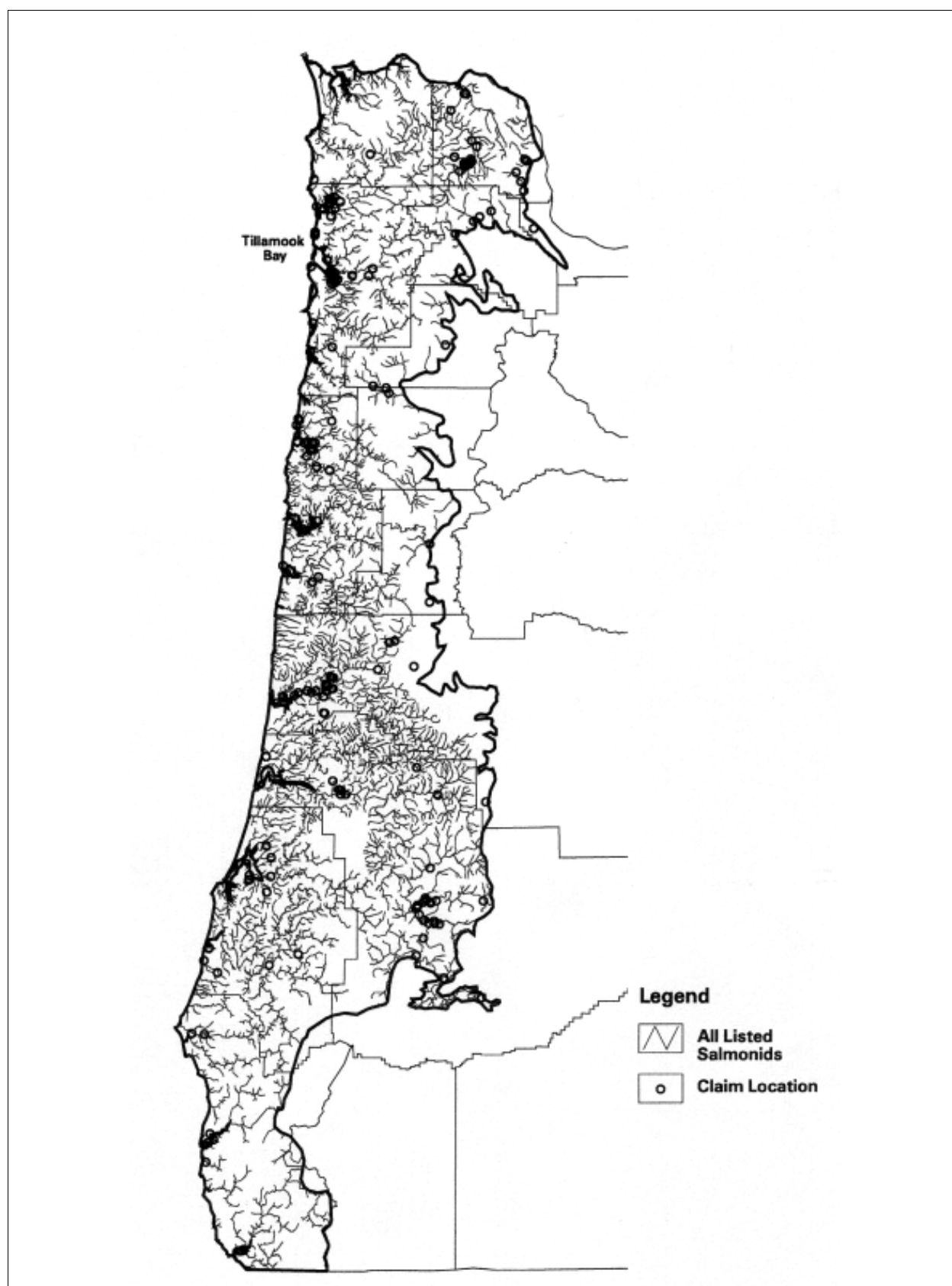


Figure 4-14. Oregon Coast Ecoregion with NFIP Claims and Salmon Distribution

*Regional Overview of Flood Risk
and Salmon Distribution*